Review on the Future energy -Non Conventional Energy Resources

Er. Karan Sahni
Department of Mechanical Engineering
Gian Jyoti Group of Institutions
Shambhu Kalan, Rajpura Distt: Patiala, India
Sahnikaran18@gmail.com

Er. Parwinder Singh
Department of Mechanical Engineering
Gian Jyoti Group of Institutions
Shambhu Kalan, Rajpura Distt:Patiala,India
er.parwinder.ps@gmail.com

Abstract **– In today's time meeting the demand of energy is major concern for almost all the nations in the world .Due to the finiteness of fossil fuels and environmental degradation the development of non conventional energy resources is taking place quite rapidly .This paper describes briefly the various non conventional energy resources, their advantages, limitations and the places where these resources could be installed and India's legal policies on non renewable energy resources.**

Keywords - Solar energy, wind energy, tidal energy, bio mass fuel, renewable energy

I. INTRODUCTION

The Industrial Revolution of the 19th century ushered in new engineering technologies. The burst in inventions in that century was extraordinary in many ways. Some of these inventions involved use of non-renewable natural resources like coal and oil. The consideration of exhaustible nature of these resources and the environmental damage from the use of these resources never occurred neither to the inventors nor the successive generations. In the hunt to sustain galloping economic activity, the dependence on coal and oil has soared at a phenomenal rate over the years. The burnt fuels result in the release of carbon dioxide and other gases into the atmosphere causing environmental damage. It has become very important to look at energy technology with a new viewpoint. There are abundant renewable sources of energy such as wind, sun, water, sea, biomass apart from even daily wastes. These sources are pollution free and hence clean energy apart from being unlimited/ inexhaustible [1]. The problem will be compounded due to fast depletion of fossil fuel deposits, quality of fuels, heavy price to be paid for basic materials plus their moving cost and above all the environmental degradation caused by the use of conventional energy sources. Under such conditions, environment-friendly and pollution-free, non-conventional and renewable energy sources known as 'clean and green energy' have emerged as vital alternatives to conservative energy sources. The renewable energy sources are clean and unlimited as they rely on sun, wind, biomass, etc., as key sources of energy.. The country is competent with large amount of sustainable resource base and non- renewable energy technologies which are well-suited for grid connected power production, energy supplies in distant areas which are not/could not be connected to the grid and for captive utilization. Non-conventional energy source like wind energy, solar energy through thermal as well as photovoltaic system, biomass and hybrid sources will assist to a great amount in enhancing power generation capacity. Hence suitable policy and program that optimize the use of accessible energy resources with new technologies have to be propagated, promoted and adopted, if necessary, by budgetary support. India has done very well in promoting and harness renewable sources of energy predominantly wind and bio-gas based power generation. With a vision to develop and propagate the non-conventional source of energy. [1]

II. WIND POWER

Wind possesses energy by virtue of its motion .Any mechanism capable of slowing down the mass of moving air can take out part of the energy and exchange into useful work. Following are the factors which control the yield of wind energy converter: -

1) The wind speed
2) Cross-section of the windswept by rotor
3) Conversion efficiently of rotor
4) Generator
5) Transmission system

In theory it is probable to get 100% efficiency by halting and preventing the course of air through the rotor. However, a rotor is able to decelerate the air column only to one third of its free velocity 100% efficient wind generator is able to convert maximum up to 60% of the accessible energy in wind into mechanical energy. In addition to this, losses incurred in the generator or pump decrease the overall efficiency of power production to 35%.

A. PRINCIPLE OF ENERGY CONVERSION

Turbines or wind mills generally works on the fundamental of converting kinetic energy of the wind into mechanical energy and then converting the mechanical energy into useful outputs such as generating electricity.

Power available from wind mill = ½ ρA V^3
Where, ρ– density of air = 1.225 Kg. / m^3 at sea level. (Due to temperature and pressure fluctuations changes by 10-15%)
A –swept Area by windmill rotor = πD^2 sq.-m. (D – Diameter)
V – Speed of wind in m/sec.

Air density, linearly affect the power output (when the speed remains constant), it depends upon altitude, temperature and barometric pressure. Fluctuations in temperature and pressure can affect air density up to 10 % in either direction.

Hot climate reduces the density of air.
Practically, wind turbines are capable to transform only a fraction of available wind power into useful power.

As the free wind stream passes through the rotor, it transfers some of its energy to the rotor and its speed decreases to a minimum value in the rotor wake. After some distance from the rotor wind the stream regains its speed from the surrounding air. We can also examine fall in pressure as the wind stream passes through the rotor. Finally velocity of the air and the air pressure again increases to its ambient atmospheric form.

B. Site Selection

Factors which are to be considered for selection of good site for wind power generation:-
1) High annual wind speed.
2) for a radius of 3 Km no big obstructions.
3) Open shore or open plain
4) Top of a smooth, well rounded hill with gentle slopes
5) Mountain gap which produces wind funneling.
6) High annual average wind speed.
7) Accessibility of wind curve at the proposed site.
8) Accessibility of anemometry data.
9) Wind structure at the proposed site.
10) Attitude of the recommended site.
11) land and its aerodynamics .
12)Local ecosystem.
13) Distance to railways and roads.
14) Nature of land.
15) closeness of site to local center\users.
16) Favorable ground cost.
17) Wind Electric transfer Systems[1]

C. Energy Storage

Wind power turbines have various operational limitations over very high and very low speeds. When the power generated by the turbine exceeds the demand, surplus energy can be stored to be used at other times. Surplus energy can be easily stored in the form of chemical energy in storage batteries. Surplus energy can also be stored in the form of mechanical energy in water power storage. In Wind power plants (WPP) as well as Hydroelectric power plants (HPP), when the power generated (Pg) exceeds the power demand (Pd), helps to moderately redirect hydro power plant output to the Pumping motor (PM) to pump the water from a secondary reservoir at the bottom of the dam to main reservoir. [1]

D. Safety Interlocks

1) Modern wind turbines are monitored and navigated by computers. If it shows any fault in operational parameters, then wind turbine is stopped.
2) Emergency stop – During adverse conditions for wind turbines, it can be straight away stopped using emergency stop.
3) Wind velocity is monitored and if gusts of wind are very strong or if the average speed is too high, wind turbine is stopped.
4) To avoid rotor from racing, two revolution counters are installed on the shaft.
5) If the turbine speed in the wind mill exceeds the limit of 28 rpm, a parachute attached to the blade tip is pulled out and therefore the speed of the wind turbine is reduced .
6) The three wind turbine blades and the turbine cap are grounded with the help of lightning rods to prevent them from lightning. [1]

III BIO MASS ENERGY

Bio Mass energy is a non-conventional energy prepared from Materials derived from biological sources. Biomass is any Biodegradable material which has stored sunlight in the form of Chemical energy. As a fuel it includes waste wood, manure, , sugarcane Straw, and many others by products from a variety of agricultural processes. By 2010, 35GW of globally installed biomass energy capacity for Electricity generation was there. The major advantages of biomass Fuel is that it is often a by-product, remainder or waste-products of other processes, such as farming, animal husbandry and forestry. Biogas is formed by fermentation of waste organic Materials such as manure, sewage and crops. Biogas comprises mainly methane (CH_4) and carbon dioxide (CO_2) and may have minute amounts of Hydrogen Sulphide (H_2S). [2]

A. Biomass Gasification

Bio gas system has contributed to maintain a more cleaner and healthier environment by processing human growth. With the increase in the means of transportations the pressure on environment have increased. The scientists are concerned about environmental conservation and looking for suitable means for the same, which are nearby available.

In present situations bio gas utilization would be a solution for environmental conservation for a society which is prosperous and healthy .

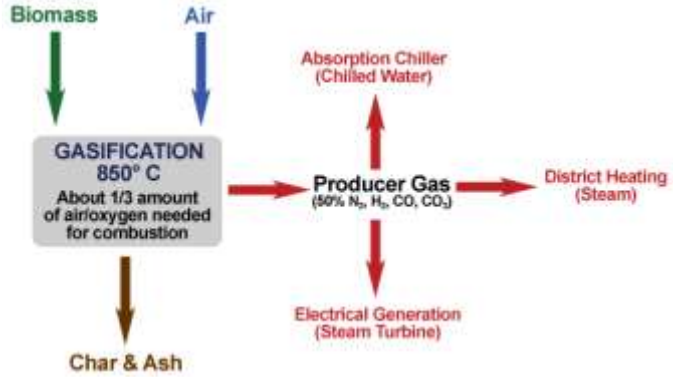

Fig 1: Biomass Gasification Process

Biomass Gasification block diagram is shown in Fig. 1 . Out of the various sources of renewable energy like solar energy , wind energy , tidal energy , wave energy, geothermal energy, nuclear energy, energy through bio mass is also an important source of energy to mitigate the future energy crises . [2]

III. TIDAL ENERGY

Tide is periodic rise and fall of the water level of the seaand oceans. [2].Tides arise due to the pull of seawater by the moon.These tides can be utilised to generate electrical power which is known as tidal power. When the water is above the mean sea level, it is called high tide and when the level of sea water is below the mean level, it is called low tide.

A dam is constructed in such a way that a basin gets detached from the sea and difference in the water level is obtained between the basin and sea. [2]

The tidal power plants are usually majorly classified on the basis of the number of basins used for generating power .

The Constructed basin is filled during flood tide and emptied During ebb tide passing through sluices and turbine respectively. The Potential energy of the water stored in the basin is used to drive the turbine which in turn generates electricity as it is directly coupled to an alternator. Tidal power has been a dream for engineers for many years and it Remained dream because of large capital cost involved in its Development. [2]

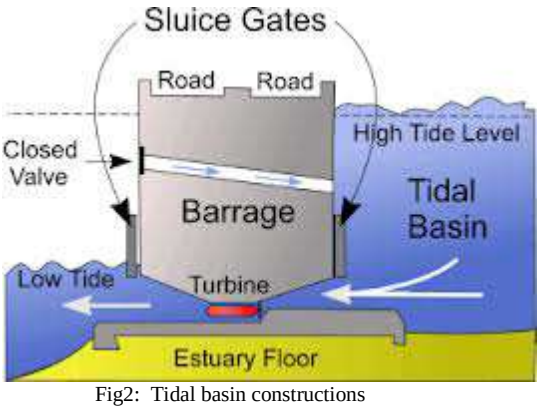

Fig2: Tidal basin constructions

A. *Classification of Tidal power Plants*

Tidal power plants are normally classified on the basis of number of basins which used for the power generation.

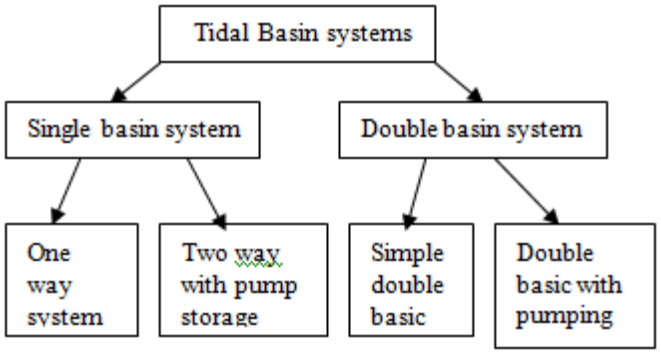

Fig 3. Classification of tidal basin constructions

Tidal power plants are difficult to construct and expensive compared to solar silicon crystalline cells. Tidal power plants needs lot of design analysis and engineering design.

Since small heads are only available, large size turbines are required; hence, the power house is also of a large structure. Both the French as well as the Soviet operating plants use the bulb.

The propeller type of turbine, with revisable blades and bulbs have their horizontal shafts coupled to a single electric generator.The cost per installed kilowatt drops significantly with the size of the turbine, and perhaps a larger turbine might be installed in a future major tidal power plants. [2]

IV. GEO-THERMAL ENERGY

Geothermal energy is heat energy which is generated as well as stored in the Earth. Thermal energy is the energy that helps to determine the temperature of matter. The Geothermal energy of the Earth's crust originate from the original formation of the earth (20%) and majorly from the radioactive decay of minerals(80%).

The geothermal gradient, which is the difference in Temperature between the core of the earth and its surface, Drives a continuous conductional flow of thermal energy in the form of heat from the core to the surface.

Geothermal power is very cost efficient, dependable , sustainable, and eco-friendly, but has historically been limited to Regions near the tectonic plate boundaries. Recent technological advancements have widely expanded the range and size of feasible resources, particularly for applications such as heating of homes, opening gateways for its widespread utilization.

Geothermal wells discharges various greenhouse gases which are trapped deep within the earth, but these emissions are much lower per energy unit than those of other emissions from fossil fuels combustions.As a result, geothermal power has the

capability to help reduce global warming if used in place of fossil fuels widely.

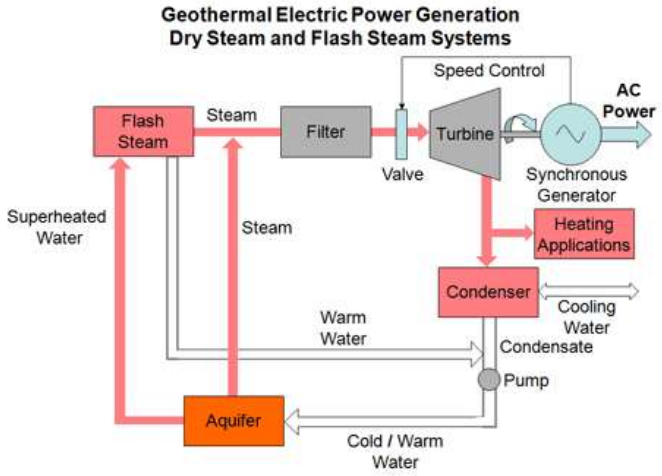

Fig 4**:** Dry Steam and Flash Steam Systems

Geothermal electricity is electricity generated from Geothermal Energy. The various Technologies which are in use include

1)dry steam power plants
2) flash steam power plants
3) binary cycle power plants.

Geothermal energy is currently used in 24 countries to generate electricity.Usually geothermal power is considered to be sustainable because the heat withdrawal is negligible as compared with the Earth's heat content. [2]

A .Classification of Geo Thermal Power Stations

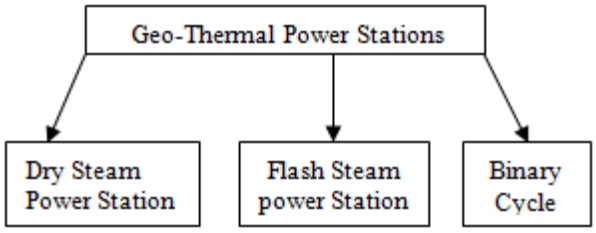

Fig 5. Classifications of geothermal power stations [2]

The dry steam plants are of the simplest and the oldest design. They use the geothermal steam of 150°C or greater directly to run the turbines. Whereas the flash steam plants pull the deep, high-pressure hot water into lower-pressure tanks and use the resultant flashed steam to drive the steam turbines. They necessitate a fluid temperatures of at least 180°C,or usually more. Today this is the most frequent type of plant in operation. The most recent development are the Binary cycle power plants, and may accept fluid temperatures as small as 57°C. The mild hot geothermal water is passed by a secondary fluid which has a much lower boiling point than water. Due to this phenomenon the secondary fluid flash vaporizes , which then runs the turbines. This is the most frequently used geothermal plant which is constructed today. Block Schematic of Dry Steam and Flash Steam Systems is shown in Fig. 4

V. HYDRO POWER

The hydroelectric power refers to the energy produced from water which is stored in the various water bodies (rainfall flowing into rivers, etc). The force of streaming water is utilized to run water turbines to create electricity..

The major annual rainfall is concentrated on the North/eastern part of India: -

1) Arunachal Pradesh
2) Assam
3) Nagaland
4) Manipur
5) Mizoram
6) On the west coast between Mumbai

.India utilizes twelve major hydroelectric power plants:

1) Bihar
2) Punjab
3) Uttaranchal
4) Karnataka
5) Uttar Pradesh
6) Sikkim
7) Jammu & Kashmir
8) Gujarat
9) Andhra Pradesh.

The estimated potential of small hydro power in India is about 15000 MW. [2]

Fig 6.Dam producing electricity using hydropower Courtesy -of the national renewable energy laboratory (NREL)

VI. RENEWABLE ENERGY SOURCES – POLICIES OF INDIA

India has a huge amount of, supply of non-conventional energy resources & hence India has decided to arrange a program for the proper utilization of non-conventional resources. India is the only country in the world to have an exclusive ministry for renewable energy development, The Ministry of New and Renewable Energy (MNRE)

The analysis of need of renewable energy sources, the policies of India through MNRE, Legal aspect of Government of India about renewable energy sources, sources of renewable energy available in India, Estimates of potential.

A. About MNRE

The Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India for all matters relating to new and renewable energy. The aim of the Ministry is to develop and organize new and renewable energy for supplementing the growing energy requirements of the country.

Creation CASE and Ministry:

1) In 1981Commission for Additional Sources of Energy (CASE) was founded.
2) In 1982 Department of Non-Conventional Energy Sources (DNES) was formed.
3) In 1992, Ministry of Non-Conventional Energy Sources (MNES) was founded.
4) In 2006Ministry of Non-Conventional Energy Sources (MNES) renamed as Ministry of New and Renewable Energy (MNRE). [7]

VII. CONCLUSION

Power outage problems are very often in future due to lack of Non-renewable inputs. So for the continuous power Utilization we have to adapt the Non Conventional methods of power generation. In this paper some of the Non Conventional techniques are proposed along with their principle as well as advantages.

Also explained are various processes with clear Block Schematics. Energy saving is not our target it should be our attitude. We have to depend on Renewable energy sources in Future otherwise various natural disasters we have to Face. Moreover requirement of power is increasing day By day and effective power Transmission is fatigue now because of nonlinear loads. Ultimately the Non renewable energy resources will help us in many ways if we use them in a Systematic and effective way of operations and utilizations. Solar And Biomass power plants are very economical and very Efficient in performance where as Wind turbine and Tidal Basin Constructions are very difficult and require large capital investment.

Fuel cells are the best Environmental friendly power Producing options compared to other Renewable Sources.

IX. REFERENCES

[1] Y.A. Sadawarte; Rajashree Prateek Pathak; SameekshaTripathi , "**Non Conventional Sources of Energy**," *International Conference on Emerging Frontiers in Technology for Rural Area (EFITRA) 2012*

[2] Mule Sai Krishna Reddy, SK Rasool Ahemmed "Non Conventional Methods of Power Generation for Future Power Outage Problems" International Journal of Science and Research (IJSR), India Online ISSN: 2319-7064.

[3] Vijay Kandalkar; Prof P.P Jagtap; "utility of non conventional energy sources to meet increasing power demands by solar power plants," in International Journal of Scientific and Research Publications, Volume 3, Issue 4, April 2013.

[4] *Rucha Korhale*; "*Renewable Energy Sources – Policies of India*,"

[5] Naval Singh; "non-conventional energy sources," Department of Electrical Engineering National Institute of Technology Rourkela 2009

[6] K.S.Sidhu; "non-conventional energy resources", Director/Research, Punjab State Electricity Board,PEC Campus, Chandigarh

[7] http://www.mnre.gov.in/

[8] E.C Thomas, "Renewable Energy in India", Electrical India, vol. 44 No.12, Dec. 2004, pp.150-152.

[9] P.M. Sayeed, "Indian Power Sector- Shaping Indian Economy", Electrical India, vol. 45 No.11, Nov. 2005, pp.157-162